



HESSI SPACECRAFT INSTRUMENT FUNCTIONAL TEST

HSI_MIT_013D

2000-NOV-15

DAVE CURTIS

DRAFT

As Run on: _____ (Date/Time)

By _____ (Test Conductor)

DOCUMENT REVISION RECORD

Rev.	Date	Description of Change
C	2000-11-14	Minor fixes to Cryocooler test, Imager tests
D	2000-11-15	Add proc number to Spacecraft power on proc reference

Western Range/NASA Safety: _____
Date

Project Manager: _____
Peter Harvey Date

System Engineer: _____
David Curtis Date

QA: _____
Ron Jackson Date

INTRODUCTION

1.1 Purpose

This document establishes the HESSI Instrument Functional test to be performed at the integrated spacecraft level.

1.2 Scope

This procedure will be performed to verify instrument functionality during or following exposure of the bus to qualification or transportation environments.

2. SETUP

- a. Power-on the spacecraft (bus and instruments) using HSI_SPACECRAFT_ON procedure (HSI_MIT_010).
- b. Telemetry rate is set to 125kbps
- c. Running on battery with TAC trickle-charging (approx 0.8amp), TAC supply current limit set to 6 amps.

3. TEST PROCEDURE

3.1 PMT Test

- a. Start the IRECORD_PMT Proc to display the PMT telemetry (in hex). This page updates once a minute.
- b. Send IDPUDUMPTBL PMTVARS to dump PMT data to the SOH Memory Dump page
- c. With the Stanford Research waveform generator (SR) connected to the RAS PMT dust cover power off , read the PMT count rate off the SOH Memory Dump ITOS page, value #1 (should be <5) Value: _____
- d. Turn on Set the SR. Verify the following settings (should be recalled on power-up):
 1. Amplitude = 5Vpp
 2. Offset = 2.5Vpp
 3. Modulation=Off
 4. Waveform = ARB
 5. Frequency = 1099.9Hz
- e. Set the Heathkit resistance box connected to the SR to 100Kohms (HI range).
- f. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be 61-6f hex. Value: _____
- g. Wait for an update of the packet dump page and snap it.
- h. Set the SR to Square waveform, Frequency=100Hz (should change frequency automatically when you change waveform select).
- i. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be about 71 hex. Value: _____
- j. Set the resistance box to 220K
- k. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be about 67 hex. Value: _____
- l. Set the resistance box to 470K
- m. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be about 47 hex. Value: _____
- n. Set the resistance box to 1M
- o. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be about 20 hex. Value: _____
- p. Set the resistance box to 2.2M
- q. Record the PMT count rate, value #1 in the Memory Dump ITOS page. Should be about 0A hex. Value: _____
- r. Set the resistance divider back to 100K
- s. Set the SR back to ARB waveform

3.2 Particle Detector Test

- a. With the nominal PD settings (IPDTHRESH=6, IPDHVDAC=122), record the PD counters (should be 0/0)
IPDCTRA_____ IPDCTRB_____
- b. Set the PD threshold to 4: Send ITOS command "/IPDTHRESH VOLTAGE=4". Record the PD Counters (should be 0/0):
IPDCTRA_____ IPDCTRB_____
- c. Set the PD threshold to 2: Send ITOS command "/IPDTHRESH VOLTAGE=2". Record the PD Counters (should be <30/0):
IPDCTRA_____ IPDCTRB_____
- d. Set the PD threshold back to 2: Send ITOS command "/IPDTHRESH VOLTAGE=6". Record the PD Counters (should be 0/0):
IPDCTRA_____ IPDCTRB_____
- e. Set the PD Bias supply to zero. Send ITOS command "/IPDHV VOLTAGE=0". Wait 3 minutes for the voltage to settle. Record the PD Counters (should be <40):
IPDCTRA_____ IPDCTRB_____
- f. Set the PD Bias supply back to nominal: Send ITOS command "/IPDHV VOLTAGE=122". Watch the counters as the IPDHVDAC steps up. Record the step number at which the counts go to zero (should be about 6):
IPDHVDAC_____

3.3 Cryocooler Test

- a. Run ITOS command "CFGMON CRYOPOWER" to calculate the Cryocooler power level on the Spectrometer power page.
- b. Verify that the CPC Status on the SOH Spectrometer Power page is "TRIPPED"
TC Verify:_____
- c. Start the ITOS script "ICRYO_ON". Verify that CPC Status is now "OK"
TC Verify:_____
- d. Record the ICT1T Temperature on the SOH Spectrometer Power ITOS page
ICT1T:_____
- e. Record the accelerometer setting on the SOH Spectrometer Power ITOS page.
Should be about 10mG IACCEL:_____
- f. Send the ITOS command "/ICRYOMAIN POWER=120". Record the value of CRYO POWER value on the SOH Spectrometer Power ITOS page (should be about 20W)
CRYO POWER:_____
- Record the time the cryocooler starts TIME:_____
- g. Send the ITOS command "/ICRYOPHASE PHASE=164". Verify that ICRYOPHASE on the SOH Spectrometer Power page reads 164 TC Verify:_____
- h. Send the ITOS command "/ICRYOBAL AMPLITUDE=70". Verify that ICRYOBAL on the SOH Spectrometer Power page reads 70 TC Verify:_____
- i. Record the CRYO POWER (should be about 20W) CRYO POWER:_____
- j. Wait 2 minutes, then record ICT1T (should have decrease from previous measurement in (d))
ICT1T:_____
- k. Record the accelerometer setting. Should be 10-20mG IACCEL:_____
- l. Send the ITOS command "/ICRYOBAL AMPLITUDE=0". Verify that ICRYOBAL on the SOH Spectrometer Power page reads 0 TC Verify:_____
- m. Send the ITOS command "/ICRYOMAIN POWER=0". Record the value of CRYO POWER (should be about 0W)
CRYO POWER:_____
- Record the time the Cryocooler stops. TIME:_____
- Enter the elapsed on-time in the cryocooler log

3.4 Cold Plate Heater

- a. Record the following values from the ITOS SOH Spec power page:

ICP1T _____
ICP2T _____
ICT1T _____
ICT2T _____
ITST _____

- b. Set the cold plate heater set point. Run the "ICP_HTR_SETPOINT" ITOS procedure. Select a temperature 5 degrees above the current value of ICP1T. Verify that ICPSETPT on the ITOS SOH Spec power page changes to the selected value: ICPSETPT _____

- c. Start the ITOS procedure "ISPEC_CPHTR_ON".

- d. Send the ITOS command "/IPWMMODE CP=7,RAS=Off, UGT=Off, LGT=Off". Record the following values off the ITOS SOH Spec Power page:

ICPPWR _____
IDPU_P100V _____
ICPHTR1 _____
ICPHTR2 _____
ICPHTR3 _____

- e. Wait 5 minutes. Record the following values from the ITOS SOH Spec power page:

ICP1T _____
ICP2T _____
ICT1T _____
ICT2T _____
ITST _____

- f. Snap and print the SOH Spec Power page.

- g. Start the ITOS procedure "ISPEC_CPHTR_OFF". Verify that IDPU_P100V is set to zero volts (+/- 5V). TC Verify _____

- h. Send the ITOS command "/IDPUNORMAL". Verify that the IDPU_MODE on the ITOS SOH Executive page reads "NORMAL" TC Verify: _____

3.5 Detector Interface

This step may be skipped if the Detector Functional is being run soon (detectors cold).

- a. Send the ITOS command "dlsetrate rate4mbps". Verify that ITOS telemetry is discontinued and the BitSync on the signal rack loses lock. TC Verify: _____
- b. Set the BitSync to 4Mbps HL (use the preset file). Verify that the BitSync regains lock and ITOS telemetry returns. TC Verify: _____
- c. Start the SSRM program on the ITOS1 work station (located in directory ssr). Set the buffer size to 1M, and click on the TCP Client OPEN button. Verify that the Connected light turns green. TC Verify: _____
- d. Start the ITOS procedure "IDIB_TM_ON" TC Verify: _____
- e. On the SSR ITOS page, push the "PlayOffset=0" button, then the "Start Record" button. Verify that the record pointer on the SSR ITOS page starts incrementing. TC Verify: _____
- f. Start the ITOS procedure "idib_evtsim1". Wait 1 minute to collect data in the SSR. TC Verify: _____
- g. Push the "Save to File" button on the SSR GSE TC Verify: _____
- h. Send the ITOS command "/ssrplayrtsi numpackets=10000, bypassedac=0". Verify that the playback pointer on the SSR ITOS page starts incrementing. Verify that the performance meter on the computer running SSRM is at maximum. TC Verify: _____
- i. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File" TC Verify: _____
- j. On SSRM, select the "Spectra", "Event Stats", and "Monitor rates" displays. Arrange the displays on the screen to show all three (Monitor Rates plot is not needed). On the Spectra display select detector 1, Log counts.
- k. On SSRM, push the Replay File button and select the most recent file (just collected). File Name: _____
- l. Verify that all 9 detectors are making events at about the same rate (on the Event Statistics display). Verify that all 9 detectors have 99% live time front and rear, but no other counts on the Monitor Rates display (record any detector making other than 0 counts): TC Verify: _____
- m. If no Monitor rates packets are sent, repeat steps h-l
- n. Verify on the Spectra plot that there are events in a block of 64 bins near the middle of the range. TC Verify: _____
- o. Snap and print the SSRM display.
- p. Select the next detector on the Spectra display and repeat steps h and j for each detector. Snap and print any spectra that has more than one bin incrementing.
- q. Send the ITOS command "dlsetrate rate125kbps". Verify that ITOS telemetry is discontinued and the BitSync on the signal rack loses lock. TC Verify: _____
- r. Set the BitSync to 125kbps HL (use the preset file). Verify that the BitSync regains lock and ITOS telemetry returns. TC Verify: _____
- s. Send the ITOS procedure "IDIB_TM_OFF" TC Verify: _____

3.6 Spectrometer Attenuator Actuators

- a. Verify that the shutters are clear of obstructions and may be moved.
Paul Turin Verify:_____
- b. Display the "SOH Actuators" ITOS page
- c. Set to engineering mode. Send the ITOS command "/IDPUENGIN". Verify that the IDPU_MODE on the SOH Executive ITOS page shows "Engineering"
TC Verify:_____
- d. Check the status of the shutter "LOCK" on the SOH Actuators ITOS page is "LOCKED". If not, skip the next step.
- e. Start the ITOS procedure "iatt_lockdown". Verify that the shutter LOCK status reads "UNLOCKED"
TC Verify:_____
- f. Check the status of SHUTTER1 on the SOH Actuators ITOS page. Verify that it reads "IN". If not, skip the next step.
- g. Start the ITOS procedure "iatt_out1". Verify that the SHUTTER1 status reads "OUT", and TENSION1 status reads "RELAXED"
TC Verify:_____
- h. Start the ITOS procedure "iatt_in1". Verify that the SHUTTER1 status reads "IN", and TENSION1 status reads "RELAXED"
TC Verify:_____
- i. Start the ITOS procedure "iatt_out1". Verify that the SHUTTER1 status reads "OUT", and TENSION1 status reads "RELAXED"
TC Verify:_____
- j. Start the ITOS procedure "iatt_unstick1". Verify that the SHUTTER1 status reads "IN", and TENSION1 reads "RELAXED"
TC Verify:_____
- k. Check the status of SHUTTER2 on the SOH Actuators ITOS page. Verify that it reads "OUT". If not, skip the next step.
- l. Start the ITOS procedure "iatt_in2". Verify that the SHUTTER2 status reads "IN", and TENSION2 status reads "RELAXED"
TC Verify:_____
- m. Start the ITOS procedure "iatt_out2". Verify that the SHUTTER2 status reads "OUT", and TENSION2 status reads "RELAXED"
TC Verify:_____
- n. Start the ITOS procedure "iatt_in2". Verify that the SHUTTER2 status reads "IN", and TENSION2 status reads "RELAXED"
TC Verify:_____
- o. Start the ITOS procedure "iatt_unstick2". Verify that the SHUTTER2 status reads "OUT", and TENSION2 reads "RELAXED"
TC Verify:_____
- p. Manually release the UNSTICK actuators
TC Verify:_____
- q. If desired, Manually lock down the shutters (check with the engineer). Otherwise skip to the next step. This operation requires starting the ITOS procedure "iatt_lockdown" when the engineer is ready. Verify when done that the LOCK status reads "LOCKED"
TC Verify:_____
- r. Send the ITOS command "/IDPUNORMAL". Verify that the IDPU_MODE on the ITOS SOH Executive page reads "NORMAL"
TC Verify:_____

3.7 RAS Shutter

- a. Verify by inspection that the RAS shutter is closed. If not, reclose. Engineer Verify:_____
- b. Set to engineering mode. Send the ITOS command "/IDPUENGIN". Verify that the IDPU_MODE on the SOH Executive ITOS page shows "Engineering" TC Verify:_____
- c. Start the ITOS procedure "iras_openshutter". In the course of the procedure, the monitor the following:
 - On the Actuator ITOS page, IDPU_ACTV goes to ≈10V.IDPU_ACTV:_____
 - On the PACI ITOS page, IDPU LD CUR goes to ≈1AIDPU_LD_CUR:_____
 - Shutter makes a loud clunk sound TC Verify:_____
 - Verify Shutter is opened by inspection Engineer Verify:_____
- d. Manually reclose the shutter Engineer Verify:_____
- e. Start the ITOS procedure "iras_openshutterb". In the course of the procedure, the monitor the following:
 - On the Actuator ITOS page, IDPU_ACTV goes to ≈10V.IDPU_ACTV:_____
 - On the PACI ITOS page, IDPU LD CUR goes to ≈1AIDPU_LD_CUR:_____
 - Shutter makes a loud clunk sound TC Verify:_____
 - Verify Shutter is opened by inspection Engineer Verify:_____
- f. Send the ITOS command "/IDPUNORMAL". Verify that the IDPU_MODE on the ITOS SOH Executive page reads "NORMAL" TC Verify:_____
- g. Manually reclose the shutter after RAS with Earth Shine GSE Engineer Verify:_____

3.8 Imager Functional

Supply cold air if possible to the RAS exterior and wait 10 minutes for the temperature to stabilize.

Verify that RAS is light tight (Use RAS baffle)

- a. Record the RAS temperatures as indicated on the SOH Thermal ITOS Page
 IRAS1T _____
 IRAS2T _____
- b. Perform a screen snap and print of a window containing the IDPU SOH displays for Executive, IDPU Voltages, ADP, Imager Voltages, Thermal, and Actuators. Append to this as-run procedure. TC Verify _____
- c. Send the ITOS command "dlsetrate rate4mbps". Verify that ITOS telemetry is discontinued and the BitSync on the signal rack loses lock. TC Verify _____
- d. Set the BitSync to 4Mbps HL (use the preset file). Verify that the BitSync regains lock and ITOS telemetry returns. TC Verify _____
- e. If SSR is not partitioned, send /ssrmakepart TC Verify _____
- f. Verify that SSRM is running on ITOS1 computer (see 3.5 b). Select Buffer Size 1Mb, Packet size = Spectrum Relay, Select TCP Client TC Verify _____
- g. Perform the RAS /SAS Dark Level test low rate:
 - 1. Start the ITOS procedure "v7s0r0_001" TC Verify _____
 - 2. Start the ITOS procedure "imgr_ssr_data_dwc(60). When the procedure is ready to play back, push the "Save to File" button on SSRM. TC Verify _____
 - 3. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File" TC Verify _____
 - 4. On SSRM, push the Replay File button and select the most recent file (just collected). Record File Name:
 - 5. File Name: _____
- h. Perform the RAS /SAS Dark Level test high rate:
 - 6. Start the ITOS procedure "v7s0r0_002" TC Verify _____
 - 7. Start the ITOS procedure "imgr_ssr_data_dwc(30)". When the procedure is ready to play back, push the "Save to File" button on SSRM. TC Verify _____
 - 8. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File" TC Verify _____
 - 9. On SSRM, push the Replay File button and select the most recent file (just collected). Record File Name:
 - 10. File Name: _____
- i. Run RAS and SAS Offset Level Mode:
 - 1. Start the ITOS procedure "v7s3r6_001" TC Verify _____

2. Start the ITOS procedure "imgr_ssr_data_dwc(60)". When the procedure is ready to play back, push the "Save to File" button on SSRM.

TC Verify_____
3. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File"

TC Verify_____
4. On SSRM, push the Replay File button and select the most recent file (just collected):

File Name:_____
- j. Run RAS Internal LED Test:
 1. Start the ITOS procedure "v7r4_001"

TC Verify_____
 2. Start the ITOS procedure "imgr_ssr_data_dwc(60)". When the procedure is ready to play back, push the "Save to File" button on SSRM.

TC Verify_____
 3. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File"

TC Verify_____
 4. On SSRM, push the Replay File button and select the most recent file (just collected).

File Name:_____
- k. Run RAS and SAS Communication Test:
 1. Start the ITOS procedure "v7s6r7_001"

TC Verify_____
 2. Start the ITOS procedure "imgr_ssr_data_dwc(60)". When the procedure is ready to play back, push the "Save to File" button on SSRM.

TC Verify_____
 3. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File"

TC Verify_____
 4. On SSRM, push the Replay File button and select the most recent file (just collected).

File Name:_____
- l. Run SAS Limb and RAS Star Test :
 1. Start the ITOS procedure "v7s5r0esthr_001"

TC Verify_____
 2. Start the ITOS procedure "v7_thr_001"

TC Verify_____
 3. Start the ITOS procedure "imgr_ssr_data_dwc(240)". Set the SSR buffer size to 128K. When the procedure is ready to play back, push the "Save to File" button on SSRM.

TC Verify_____
 4. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File"

TC Verify_____

5. On SSRM, push the Replay File button and select the most recent file (just collected).
6. File Name: _____
- m. Run SAS Limb and RAS Star Test with Earth Shine GSE:
 1. Mount the Earth Shine GSE for RAS TC Verify _____
 2. Turn power switch on to two GSE boxes, Switch to battery mode (up)
 3. Start the ITOS procedure "v7s5r0esthr_001" TC Verify _____
 4. Start the ITOS procedure "v7_thr_002" TC Verify _____
 5. Start the ITOS procedure "imgr_ssr_data_dwc(240)". When the procedure is ready to play back, push the "Save to File" button on SSRM. TC Verify _____
 6. Wait for the playback to finish. Verify that the performance meter on the computer running SSRM reduces to about 50%. Turn off the "Save to File" TC Verify _____
 7. On SSRM, push the Replay File button and select the most recent file (just collected).
 8. File Name: _____
- n. Transfer the files collected on the SSRM above to the sunny~/tmp/psi/ site and e-mail Alex Zehnder and Martin Fivian their locations. TC Verify _____
- o. Send the ITOS command "dlsetrate rate125kbps". Verify that ITOS telemetry is discontinued and the BitSync on the signal rack loses lock. TC Verify: _____
- p. Set the BitSync to 125kbps HL (use the preset file). Verify that the BitSync regains lock and ITOS telemetry returns. TC Verify: _____

3.9 Imager Heaters

- a. Bring up the ITOS "SOH Thermal" page TC Verify_____
- b. Snap and print the Thermal SOH ITOS page. TC Verify_____
- c. Send the ITOS command "/IPWMMODE CP=0,RAS=On, UGT=Primary, LGT=Primary". Verify that the following on the Thermal page:
 - UGTPWM =Primary
 - LGTPWM = Primary
 - IRASPWM = Enabled TC Verify_____
- d. Send the ITOS command "/IDPUARM HTR". Verify HTR on the Thermal page shows "ENABLED" TC Verify_____
- e. Send the ITOS command "/IRASSETPT VALUE=30". Verify that IRASSETPT on the Thermal page reads 30 TC Verify_____
- f. Send the ITOS command "/IUGTSETPT VALUE=30". Verify that IUGTSETPT on the Thermal page reads 30 TC Verify_____
- g. Send the ITOS command "/ILGTSETPT VALUE=30". Verify that ILGTSETPT on the Thermal page reads 30 TC Verify_____
- h. Verify that, after a few minutes, the IRASHTRV, IUGTHTRPV, and ILGTHTRPV read 28V periodically TC Verify_____
- i. Verify that the temperatures are rising from the initial snap. Snap and print the Thermal SOH ITOS page. TC Verify_____
- j. Send the ITOS command "/IPWMMODE CP=0, RAS=OFF, UGT=OFF, LGT=OFF". Verify that the following on the Thermal page:
 - UGTPWM =Off
 - LGTPWM = Off
 - IRASPWM = Off TC Verify_____